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ECONOMIC ASPECTS OF INLAND WATER TRANSPORTATION

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I. THE AGITATION FOR WATERWAY IMPROVEMENT

WE have been witnessing for many years in this country a very powerful and persistent agitation for the rehabilitation and improvement of water transportation. The movement began as long ago as 1895, and by 1903 had gained enough momentum to vote an appropriation of $101,000,000.00 for the improvement of the Erie Canal in New York. But the widespread and popular interest in the improvement really dates from 1906. In that year two history-making meetings were held, the St. Louis Convention and the Washington session of the Rivers and Harbors Congress. Out of the former grew the organization known as the Lakes-to-Gulf Deep Waterway Association; while the latter led to the appointment by President Roosevelt of the Inland Waterway Commission.

This commission made an extended investigation of waterway possibilities in the United States, ending with a memorable and joyous excursion down the Mississippi in 1907, with President Roosevelt as the guest of honor. "On the average each river town showed more spectators standing out to salute the presidential party than the entire population; while day and night the air was rent with acclamation of voices, steam whistle, shrieking siren, salvo of guns, and roar and rattle of fireworks." There followed a veritable harvest of Congresses and Conventions in a score of states, and there has been but intermittent abatement of zeal in the ensuing years. The question has been at times of absorbing political interest. In New York in 1903 the referendum on the Erie Canal proposition called out the largest referendum vote ever known; while in Illinois waterway appropriation has been the prize around which has centered for years a bitter struggle of rival leaders and political factions which has disgraced the very name of the state.

In the way of practical achievement the agitation has resulted in the appropriation of $101,000,000.00 for the enlarge-

ment of the Erie Canal, already noted; a congressional authorization of the improvement of the Ohio River at cost of $60,000,000.00; and the recent passage of a bill in Illinois providing for the improvement of the old Illinois and Michigan Canal as a connecting link between the Drainage Canal and the Illinois River; and numerous appropriations for minor projects in pursuance of our congressional policy of "pork barrel" legislation.

There remain as yet without financial backing a veritable host of projects, some definitely outlined and surveyed, others ill-defined and more or less chimerical, the total cost of which would reach many hundreds of millions of dollars.

The causes and influences lying back of this widespread and ambitious program are peculiarly interesting when studied in connection with the economic aspects of the transportation problem. The movement is a very illuminating example of the utterly haphazard and ill considered way in which we attempt to promote the general welfare through the agency of government.

II. Causes for the Movement

As to causes, the waterways movement appears to be a part of the general movement for the conservation of our national resources. Our waterways are conspicuous reminders of our improvident past. Quoting a recent writer, "At Cincinnati and Pittsburg hundreds of boats have given places to tens. Where once on the Missouri there were sixty, there now remains but one to remind us of the departed glory of our waterways. Along our wharves—old gang-planks, anchors, and broken machinery are tangled in the grass growing in the crevices between the cobblestones." Railways parallel the banks of great rivers, deserted save for a few small boats of uncertain schedule, or they run in the very channels of abandoned canals. Such spectacles compel reflection, and they recall the early days of water transportation in this country. There is a lingering glory about our great navigable rivers and inland seas that is not easy to dissipate. The waters which led Fathers Marquette and La Salle to the heart of an unexplored continent, the rivers which carried the American pioneer beyond the Alleghenies to the great Middle West, and on whose banks he built his home and reared his family are associated with a most romantic history.

Again, the very great part waterways played in the actual development of our country prior to the Civil War has served as a powerful influence in support of their resuscitation. In our

early history they long served as the chief unifying agencies in our national life as well as the great avenues of commerce. Where canals were built, villages and cities sprang up as by magic, wealth poured into the contiguous territory, and industry thrived in the entire region. Today the inhabitants along proposed water routes again see visions of reviving industries, of booming towns and cities, of fleets of barges laden with the commodities of commerce borne swiftly along the surface of the waters. It is an alluring picture; and it is widely believed that all that is needed to make that picture a reality is the improving and connecting of our rivers and lakes.

Waterways and Lower Freight Rates

But by far the most potent force for waterway development is the argument that water transportation is decidedly cheaper than rail transportation. Various estimates of the great reduction in transportation charges to be effected by means of waterways have been made and it is generally believed that the cost of water transport is but a fraction of that by railway, the estimates varying from one-half to one-tenth and even one-fourteenth. Such convictions obviously furnish to the advocates of waterways the most practical of campaign weapons. Note: I am merely giving here the popular impression. The truth of the contention remains to be tested.

Accompanying the belief that water transportation is inherently more economical than railway transportation is the conviction that the railroads having monopolized the transportation of the country, are charging extortionate rates, which an unwilling but helpless public must pay. It is pointed out that wherever railroads are subjected to water competition the rates are substantially lower than elsewhere; that the water rates on grain from Buffalo to New York are about one cent a bushel higher than when the Erie Canal is open. The railways should therefore be subjected to competition from Government waterways. Whether the waterways carry the traffic or not, the potential water competition will force the railroads to carry at a low rate, to the benefit of American shippers. Waterways are, consequently, a means of railroad rate regulation.

European Experience with Waterways

Finally, the example of foreign waterways has had a great influence upon the movement in this country. It is well known that in Germany, France, and Belgium waterways have continually served as public carriers. They exist along with the

railroads, apparently complements one of the other. The Manchester Ship Canal is said to have solved the great transportation problem of that city, and throughout England there has been for some time a movement for the resuscitation of inland waterways. Vast sums of money have been spent upon these European waterways, with success apparently sufficient to warrant the present increasing appropriations in nearly every country on the Continent. Nearer home, Canada is bestirring herself, and planning a great ship canal to the Lakes. If waterways are successful abroad, it is reasoned that they should prove likewise successful in America. Note again that at this point I am merely giving the popular reasoning on the subject.

III. Merits of the Waterway Propaganda

Turning now from this brief survey of the nature and causes of the waterway movement, let us turn to an analysis of the merits of this waterway propaganda. We shall find it surprisingly easy to show that the movement has been largely ill-considered and ill-advised, and that, in the main, it is economically unsound. The question of the relative cost of water and rail transportation is obviously the paramount consideration.

The popular argument that water transportation costs only a fraction of that by rail runs somewhat as follows: The average charge made by all the railways of the country for the calendar year 1907, for example, was 7.82 mills per ton-mile. On the Great Lakes the charge was .8 mills per mile and on the Erie Canal about 3 mills per ton-mile. A dollar then will carry a ton of freight the following distances: by rail, 127 miles; on the old Erie Canal, 333 miles; on the Great Lakes 1250 miles; and on the enlarged Erie Canal nearly 2000 miles.

In considering these statistics of comparative costs it is necessary to inquire if the term *cost* has the same meaning in the various cases compared. The *costs* given above, it will be noted, are synonymous with rates charged. Now, what is included in the making of rates in the various cases, and are *rates* and *costs* fairly synonymous terms?

The average freight rate which we have been considering was levied so as to secure to the railways a profit upon the entire capital investment of the railways of the country.

The cost of building the roads, cost of equipment, of maintenance, and of operation, that is, the actual hauling expenses, all were considered in the adjustment of the rates on the railway. Let us now pass to a consideration of what is included in the term *cost* as used in connection with the waterways.

Cost of Water Transportation

It is said that a dollar will move a ton of traffic on the Great Lakes a distance of 1250 miles, as against 127 miles on the railways. But since the Great Lakes constitute a highway made by nature, the rates charged there need be merely sufficient to yield a reasonable profit on the investment in the ships, in addition to meeting the expenses of operation. Naturally the rates under such conditions would be much lower than if they had to earn a profit on a tremendous investment in the highway itself. A comparison of railway rates with the charges on canals, which, like the railways, are artificial highways, evidently affords a fairer basis from which to draw conclusions.

It is contended that one dollar will move a ton of traffic on the railways only a distance of 127 miles, as against 333 miles on the present Erie Canal; and that with the opening of the new barge canal this distance will be extended to about 2000 miles. What is meant by cost as applied to the Erie Canal? It was built by the state of New York and is now donated to private use. Anyone who desires can build a boat and engage in the carrying trade free of charge on the state's highway. If he can earn in addition to the operating expenses a reasonable profit on the cost of a small boat or barge he is satisfied. Thus, whereas the railway rate is fixed to cover a profit upon the total cost of the highway's equipment, upkeep, and operation, upon the railways, the rate on the Erie Canal has to cover no part of the enormous expenditures involved in the construction and maintenance of the waterway itself. Thus the cost item which is by all odds of chief importance is omitted from computation. The cost of building and maintaining a canal, as in the case of a railway, is always the chief outlay connected with the transporting of goods. Indeed, it is the tremendous amount of fixed capital involved that particularly distinguishes the transportation business. Consequently, in comparing the relative cost of two rival modes of transit, to omit the enormous construction and maintenance expenditures in the one case, and to include them in the other is totally to invalidate the conclusions drawn. Yet this is the method that is commonly employed in proving water transportation less costly than transportation by rail."

The New York Barge Canal

The latest figures indicate that the total cost of enlarging the Erie Canal will not be $101,000,000.00, as originally estimated, but approximately $135,000,000.00. This is an average of $330,000.00 per mile. This is to be compared with an average rail-

way capitalization of less than $60,000.00 per mile, for the country as a whole, and with a present day cost in the eastern states of probably not more than $100,000.00 per mile. At least three fully equipped double-track railways could be constructed between Buffalo and the Hudson for the cost of the new Erie Canal.

It is argued, however, that since the state will charge no tolls on the canal that this enormous capital cost need not be borne by the shippers. True; but it must be borne by someone. If the state builds and keeps in repair a canal, which is donated to the use of shippers free of charge, interest on the bonded indebtedness and the annual maintenance charges are not thereby eliminated. They are merely shifted to the taxpayers and remain quite as much *costs* of transportation as when paid by shippers in toto, as in the case of rail transportation. In fact, the people of New York are going to find their taxes increased in consequence of the expenditures on the Erie Canal by over $7,000,000.00 annually.

To get an accurate comparison suppose New York State, instead of enlarging the Erie Canal were to construct a double track railway for freight purposes only, and were to donate this to a company free of interest charges, and with all costs of maintenance and upkeep defrayed out of the public treasury. Suppose a railway company having therefore to cover merely direct handling and haulage expenses, including a fair return on the cost of rolling stock, and you have the parallel of present day canal operation. With such aid is it not probable that the railways could quote rates less than 7.82 mills per ton mile? The fact is, that thus considered, with all items of cost included on both sides of the equation, water transportation costs substantially more than rail transportation.

When driven to face this question of indirect cost, however, the waterway advocate usually replies that while it may be true that the original cost of building canals is greater than that of railways, this is much more than counterbalanced by the vastly greater carrying capacity of canals. Let us briefly test this argument.

The method employed in showing the greater carrying capacity of a canal is to proceed upon the assumption that the canal is to be utilized to its maximum capacity, whereas the data for the railways are based upon actual tonnage statistics. But since a railway is seldom used to anything like its full theoretical capacity, the comparisons that are thus made are wholly inconclusive.

(*Concluded in December*)

THE WEATHER FACTOR IN THE GREAT WAR: V SPRING AND SUMMER, 1916*

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The Western War Zone**

THE German attack upon the Verdun salient, begun at a season meteorologically unfavorable, was probably undertaken then in order to forestall the long expected "spring drive" of the Allies, and to force an enormous expenditure of French ammunition. Snowstorms and miry, treacherous ground were serious obstacles in the way of the most effective offensive movements. In spite of all such handicaps, the German attacks were continued with remarkable persistence and severity, there being only slightly reduced activity when spells of bad weather hindered artillery firing. The importance of having a wind of the right direction and velocity when asphyxiating gas is used was strikingly shown on two occasions. A French gas attack (Berlin report, May 18) failed to be serious because "a squally wind" sprang up and diffused the gas. And during a German gas attack in the Champagne district (Paris report, May 22) an unexpected change in wind drove the deadly fumes back into the German trenches. The situation along the remainder of the western front may best be summarized in the words of a British officer: "Mud was the reason why we could not attack and thus relieve the pressure on Verdun. It was the season the Germans would have chosen for us to attack." In Gen. Haig's official report, covering the winter and spring months, reference is made to the necessity of constant and heavy work in maintaining and repairing the trenches, destroyed by bad weather and by the enemy's bombardment. The relief from the cold and wet of the winter trench-fighting was very welcome. One report (Apr. 26) mentions an attack, after two days of spring rain, when the men "sank up to their arm-pits in the morass, and half-crawled, half-swam, under shell fire."

It may have been accidental, but it probably was carefully planned, that, after what was reported to have been an unusually

* Previous papers in this series are as follows: *Popular Science Monthly*, Vol. 85, Dec., 1914, 602-613; this *Journal*, Vol. 13, Feb., Mar., 1915, 169-171, 209-216; Vol. 14, Nov., 1915, 71-76; June, 1916, 373-384.

** The present article does not refer to minor and constantly repeated influences of weather conditions upon military operations, enumerated in the earlier papers of this series. Attention is here paid chiefly to the larger controls, and to new facts.

wet and disagreeable June, the great Allied drive began most auspiciously (July 1) on a fine, warm, clear day, with brilliant sunshine. This was a great advantage to the British and French artillery observers, who were able to see long distances and could direct their fire most effectively. The good weather, it is noted, helped greatly in the recovery of the wounded. But there were many weather conditions during the remainder of the summer which were far less favorable. "Mists", which were obviously the early morning fogs so common after clear, calm nights, several times made it difficult for the infantry units to keep in touch with one another, and for the gunners to follow their advance, until the sun later "burned off" the fog. Heavy thunderstorms became more frequent as summer advanced, and these, together with heavy general (cyclonic) rains lasting many hours, often "compelled a lull." In some cases the fighting continued, but it was usually limited to artillery duels and bombing operations. During dry spells the dust raised by the bursting shells was greatly increased by the dust caused by marching troops and by traffic. It became impossible to determine the exact position of friend or foe. Haze, resulting in "low visibility", and low clouds, made artillery observations difficult. In one case the Germans profited by a thick haze to bring up fresh troops and guns. At the end of July mention is made of "sweltering heat", and of the "first real hot wave of the season". Clear, hot summer weather was reported "everywhere in Germany", and was welcomed as bringing very favorable crop conditions after many days of clouds and rain. The use of carrier pigeons was not attempted in "bad weather". Only once (June 27) was mention made of a change of wind during the employment of poisonous gas. On that day (Berlin report) the gases "in some cases floated back to the enemy trenches".

Eastern European War Zone

The spring thaws, with the resulting floods, the necessary abandonment of low-lying positions, and the almost insuperable difficulties of transportation, were doubtless important factors in preventing a Russian spring drive. The Germans, generally established on higher ground, and with far more ample and sufficient railway communications, were not as severely handicapped. It is reported that Field Marshal von Hindenburg foresaw this, and halted his autumn drive into Russia before it was necessary, in the hope that spring conditions would automatically compel a retirement of the Russian lines. It is not improbable that the Germans, trusting in the expected effects of the late Russian

spring thaws in holding the eastern battle lines essentially unchanged, were the more ready to mass their troops for the Verdun attack. Yet these same thaws forced a certain amount of fighting on the eastern front, for when the trenches were flooded along the Dvina River, and in the swamps around Dvinsk, both sides made a desperate struggle to hold, or to gain, the highest ground. Water had to be pumped out of the trenches; some attacks were actually made in boats; and the men were often in water up to their breasts.

On March 15 it was reported that about 100 vessels carrying war supplies were frozen in at or near Archangel. On April 1 a Copenhagen despatch noted that the ice in the White Sea was beginning to melt, and that maritime traffic would probably be resumed at Archangel by April 15.

The spring drive of the Russians on the eastern front was doubtless delayed beyond the expected time in order that better weather would prevail, although the lack of ammunition was probably an additional reason for the delay. Very cold weather was reported in Russia early in June. Snow fell in Kazan. Temperatures below freezing were recorded in Nizhnii-Novgorod. Crops, well advanced owing to an early spring, were frost-bitten in southern Russia. During late July and in August operations in Galicia were impeded by floods. Bridges were washed away. Owing to the lull in the fighting the Austro-Germans were enabled to send some of their troops as reenforcements to other fronts.

The Austro-Italian War Zone

There is nothing new to report from this battle front. The struggle between man and man has been accompanied by a continuous struggle between man and nature. Storms, deep snows, avalanches, heavy rains and fogs have added greatly to the difficulties.

The Russo-Turkish War Zone

Floods caused by melting snows in the Pontine Mts., back of the sea-coast, washed away the bridges on the coast road, made it difficult or impossible for the Turks to bring supplies and reinforcements to Trebizond, and hastened the fall of that city (April 18). The capture of this important place, and other events in the nearer East, showed clearly that Russian activities were not seriously hampered by the difficult terrain nor by the heavy winter snows and cold weather on the mountains and plateaus of that rugged region. In May, the spring melting of the deep snow favored the descent of the Russian armies from the

higher elevations into the valleys and lowlands, and was followed by an increasingly active campaign.

An American agent who visited the German prison camps in Russian Turkestan emphasized the importance of having a knowledge of the climate before forming any judgment of the conditions and treatment of the prisoners of war there. The extreme dryness, the long, hot summers with temperatures of 120°F. and over, and the short, cold winters, with temperatures below zero, bring sharp extremes. The winter cold results in closing the windows, and when the prisoners are confined in close quarters this lack of fresh air becomes a very serious problem. In mid-July the Russian Cossacks in crossing the Armenian mountains reached the snow line.

The British Mesopotamian Campaign

In regard to the British surrender at Kut-el-Amara Lord Kitchener said that adverse elements alone were responsible for the lack of success. Constant rain and the consequent floods had not only impeded the advance of the Relief Expedition but had compelled, in place of a turning movement, a direct attack upon an impossibly narrow front. The House of Lords would not fail to realize, the War Minister said, how tense was the strain upon these troops, which for more than twenty weeks had held their positions under conditions of abnormal climatic difficulty and on rations, calculated for protraction to the furthest period until, as it proved, imminent starvation compelled their capitulation. During a heavy thunderstorm in March (Berlin report) the principal British camp was struck by lightning, and "extensive damage was done". On April 12 Gen. Lake reported that water from the marshes was driven by a northwest gale into some of the enemy's trenches, driving the Turks out to a new position. Many engagements were fought with the men up to their hips in water. With the advance of spring, the heat became intense. On May 20, Gen. Lake reported "the weather is intensely hot and trying", with temperatures over 100° in the shade.

The heat was so intense (over 120°F.) in July that both British and Russian troops had to remain inactive for many days. The Russians retreated almost 80 miles in the Bagdad region. The principal reason for this retreat was the intense heat, which made campaigning very difficult. It was reported that the Russians planned to remain in the cooler hill country until the temperature conditions made the resumption of the advance expedient. On July 16 Sir Victor Horsley, the eminent surgeon, died of heat stroke.

The War in Africa

In the campaign against German East Africa Gen. Smuts reported (early in March) that heavy rains and swollen streams hindered pursuit on the part of the British. Bridges were washed out, and had to be repaired. Under date May 1 Gen. Smuts reported "the rainy season has set in with great violence". In Egypt, the advance of the hot season made the chance of any serious attack from the east, across the desert, very unlikely, if not altogether impossible.

After the German drive through the Balkans, early in the winter, and the opening of communication between Berlin, Vienna and Constantinople, a Turko-German attack on the Suez Canal was expected in the favorable months of January, February and March, "when white men may manoeuvre in the desert". This attack did not materialize, probably because the troops necessary for this undertaking were needed elsewhere. A Turkish attempt to reach the Canal early in August failed completely. The troops advanced in the face of the greatest difficulties; their guns were dragged across the desert on planks, which were used to prevent the wheels from sinking into the sand. The routed Turks suffered terrible hardships in their retreat. In some cases the men suffered so much from thirst that they killed their camels and drank the blood. The Turkish despatches mentioned a "gigantic sandstorm", which impeded their left wing. Taking advantage of this condition, the British made a successful surprise attack.

The War in the Air

An air raid on England took place early in March, during a snowstorm, and with "more than a little wind" from northeast. Before this several Zeppelins had been brought down owing to the weight of snow upon them, but on this occasion no such result was reported. During another raid, on April 1, under very favorable weather conditions, a Zeppelin was brought down and the crew was captured. The men reported that the night was so cold that their air-ship was covered with frost, and they suffered severely. On April 25, on a dark, clear night, three Zeppelins visited the eastern counties of England when the wind was southwest. Up to that time, the raids had been made during light easterly winds. On this particular occasion, however, the wind, although from the wrong direction, was very gentle, and "any threat of a storm was lessened by a favorable barometer". It appears, more and more emphatically, that the Germans have made a very careful study of weather conditions before starting

their Zeppelin raids, and it also seems as if, with their new super-Zeppelins, they are becoming somewhat more independent of wind and weather. Early in May, however, Zeppelin L-20 was blown eastward by a strong wind and was wrecked on the coast of Norway. On May 6 a number of French captive balloons broke loose during a sudden storm and were driven into the German lines. One of the sensational exploits of the war was the feat of Sub-Lieut. Guynemer, of the French Army. On one of his flights he chased a German to a height of two miles, where the cold was so great that the oil in his machine gun congealed. Nothing daunted, Guynemer dashed against the German machine; both fell; the German was crushed at the end of the fall, but the Frenchman came down safely.

A distinguished European aviator has recently said that favorable weather conditions are no longer necessary when flights are undertaken, but that the men go up "when they have to", without regard to the weather. While this is to a certain extent true, it must not be taken too literally. Thus, on the western front, we note that rain and thunderstorms and low clouds and bad weather frequently interfered with air work. Low clouds and fog "mists" make low flying necessary, and expose the aviators to the danger of gun and rifle fire. In his criticism of the British Air Defense against Zeppelin attacks, Lord Montagu rightly said: "Our greatest ally has been the weather". Some interesting details regarding the work of the British aviators in Egypt were contained in a despatch from British General Headquarters in Egypt (July 8) to the London *Chronicle*. "All the difficulties of flying under tropical conditions with an equipment not designed to meet such special circumstances" were met with. The intense heat caused gasoline tins to burst. Evaporation was so great that a consignment of 7 cases supposed to hold 56 gallons contained only 37 gallons. Thorny plants punctured the tires of the motor trucks. With the thermometer "registering 120° in the shade" work was hard. Most of the transport was done with camels. Flying after mid-day was dangerous because of "heavy storms" (doubtless daytime winds, carrying sand).

The War at Sea

In the autumn of 1915, British submarines carried on an active campaign against the shipping (chiefly ore boats) between Scandinavian and German ports. During the winter, these undersea boats seem to have been laid up in Russian Baltic ports. With the breaking up of the ice in the spring, the campaign began again.

Bad weather in March caused many of the Entente Allies' mines to get adrift, making entrance to the Channel easier. The result, according to official French reports, was a greatly increased activity of German submarines in that region.

There is no doubt that meteorological conditions played an important part in the Jutland sea fight of May 31. Admiral Sir John Jellicoe, in his official report, said: "Weather conditions that were highly unfavorable robbed the fleet of the complete victory expected by all ranks". These unfavorable conditions resulted from a thin drizzle or mist, which reduced the visibility and obscured the German ships, greatly handicapping the British gunners. The British ships, on the other hand, were silhouetted sharply against a clear western horizon. What the results would have been if the German war vessels had been as easily distinguishable as the British, will never be known.

A German View of the Weather and the War

In these articles all the facts cited have been taken from the reports (mostly official) published in American papers and magazines. It is interesting to see what a German writer has to say on the same subject. The first German publication in which the weather influences in the present war are mentioned, so far as the writer is aware, is a little book, "Vom Wetter", by Dr. Hennig, 1915.

The winter of 1914-15 was, with the exception of a few cold spells, exceptionally mild. The December, January and February means were higher than normal. In eastern sections, November was a little too cold, and the March means were also generally below normal. Minimum temperatures in eastern Europe were several degrees (15°-20° or more) higher than usual. The cold spells in the east were scattered through the winter, e. g., in early and late January, early February, and in the first half of March. In the Carpathians, Serbia and the Caucasus cold and snow caused great suffering. Dr. Hennig says that a colder winter over the rest of the battle-grounds would have been a help to the Germans. In November, 1914, Field Marshal von Hindenburg hoped for a long period of severe cold which would prevent the Russians from throwing up fortifications. The Russians, on the other hand, also longed for a severe winter, hoping (in the words of Dr. Hennig) "that, as in 1812, 'Gen. Winter' would win their battles for them which they could not win themselves." The Germans would have had a far easier campaign if the flooded areas in Flanders and the marshes in Russia could have been crossed on the ice. In Flanders and

northern France, however, such a thickness of ice comes only rarely. August, 1914, brought great heat. The maxima Aug. 9-10, at Mulhausen, were over 85° Fahr. And during the first battle at Lemberg, at the end of August, the heat was also so great that rains on Sept. 1 were very welcome. The summer of 1915 was very favorable, with excessive heat on a few days only. Seasonable temperatures, almost without exception, prevailed during the German summer "drive" against Russia. The spring and early summer (1915) were unusually dry. Thunderstorms seem to have been comparatively few in number, probably, according to our author, because the temperatures were not generally very high. Zeppelin L 10 was struck by lightning Sept. 5, 1915, while over the sea near Cuxhaven.

The Entente Allies' movements (Sept. 1914) in the long battle of the Aisne were much hindered by bad weather and high water in the rivers. This gave the Germans time to build trenches and fortifications, which long proved useful. Certain French failures near Soissons were ascribed by them to bad weather in order to conceal their own incompetence, in Dr. Hennig's opinion, for the rains and floods in no way interfered with the German operations. On Aug. 28, 1914, a fog favored an advance of British war vessels against Heligoland. Three small German cruisers were lost by reason of their steaming into the midst of the enemy ships during the fog. When the fog cleared, the German vessels were speedily attacked and sunk.

(Dated Sept. 28, 1916).

The Earth Science Section meeting of the Central Association of Science and Mathematics Teachers to be held in Rosenwald Hall Lecture Room, University of Chicago, Friday afternoon and Saturday morning, December 1 and 2, promises to be of unusual interest to geographers. F. W. DeWolf, Director of Illinois Geological Survey, speaks Friday afternoon on "Geological Science as Adapted to the Development of Mineral Resources, with Special Reference to Illinois." Several discussions on the topic, "Some Experiences in Schools where the Junior-Senior High Schools are in Operation," follow Mr. DeWolf's address. Prof. Chas. R. Dryer is the principal speaker Saturday morning. Robert G. Buzzard, formerly of the Harvard School for Boys in Chicago, discusses "Geography and Boys." Several short speeches by Normal School teachers of geography on professional aspects of the subject follow. It will be a meeting well worth our while as students and teachers of geography.—[*Bull. Ill. Council of Geog. Teachers.*]

HIGH SCHOOL COMMERCIAL GEOGRAPHY*

By SUMNER W. CUSHING
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ORGANIZATION

THERE are three schemes of organization in common use in schools and textbooks. First, there is the *regional* treatment that uses the country or state as the primary unit of thought; second, the *commodity* treatment, wherein important commodities of commerce play the leading part; and third, the *economic* treatment in which the most important role is assumed by the four great fields of commerce and industry—(1) primary production, (2) transportation, (3) manufacturing, and (4) consumption.

The strength of the regional treatment lies chiefly in its practicality. The general reader meets continual references to countries or states. He finds it useful to have his knowledge indexed by political units. The most serious objection to the regional treatment is that it almost inevitably seems monotonous to students because their course in elementary geography has already been based on regions. The commodity treatment is probably the weakest of the three if it is consistently followed throughout the course. The study of a few representative commodities, specially selected for definite reasons, can well be approved, but beyond these the work has an irksome sameness and is aimless since no important new principles are presented, and the problems to be solved are all of the same kind.

The economic basis for a course in commercial geography is strong in the newness of approach from the students' point of view, in the life it may receive from local studies, and in the usefulness of the body of knowledge it builds up, and the power it develops. Nearly every community in which commercial geography is taught presents problems in each of the fields of commerce and industry. There may be local farming, forestry, fishing, or quarrying to illustrate the forces at work in the field of primary production. There is almost sure to be a great variety of means of transportation, each showing the local solution of a universal problem. Manufacturing plants offer ample first-hand material for illuminating the varied forces at work influencing the character and distribution of industries. The community itself inevitably exhibits the relation that the consuming center has to each of the other fields of the subject. If this economic

* Prepared for a *Bulletin on Commercial Education* to be issued by the Massachusetts Board of Education.

outline be strongly reinforced with a secondary regional treatment, that is, if the local study of transportation, for example, be followed by the study of transportation in the United States, and then by comparison with other countries, an ideal organization would seem to be attained.

The usefulness of the knowledge and power produced by a course built upon the economic basis is apparent when it is recalled that the problems that confront the man of practical affairs center around the raw materials or primary products, transportation, manufacturing, and the marketing of the finished products. The lack of textbooks built upon this plan is its only serious drawback.

If a course in commercial geography based upon the four economic fields is given in the junior high school it would seem best to give the subject a regional basis in the commercial department of the senior high school.

Order of Treatment

The logical order of the adult is rarely the order to be followed by the student. His interest is the controlling factor in determining the order of treatment. Since the course is founded upon local studies in the four fields, the best time for studying the local phase will determine the best time for considering the broad field in general. Obviously the best season for studying primary production locally is not in winter; it may be in the fall. In general the spring would seem to be the season when interest in primary production is highest, especially if farming be the most prominent local phase of primary production. Visits to manufacturing plants can be made as readily in winter as at any season. Studies in the consumption field can similarly be carried on equally well at all seasons. Transportation problems are probably the easiest of the series and the factors are most readily observed. Hence this field may well be treated first. It would seem, therefore, that a course in commercial geography should consider the fields in the following order: (1) transportation, (2) manufacturing, (3) consumption, and (4) primary production. The interest of the students and local conditions, however, must decide the details of organization.

Distribution of Emphasis

Emphasis in a course of study may be indicated crudely by giving the time allotted to the various subjects of the course. Since Massachusetts is so largely a manufacturing state dependent upon raw materials and food brought from a distance, and

upon products carried to distant points for sale, manufacturing and transportation should be the fields having the greatest amount of attention. Perhaps two-thirds of the total time should be devoted to them, while the other third should be equally divided between primary production and consumption. In a farming section, however, greater emphasis should be put upon primary production than upon any other field. In a word, the probable occupations to be followed by members of the class will be the chief factor in determining the distribution of emphasis among the fields of the subject.

Fully as important as the distribution of emphasis among the four fields of commercial geography is the distribution of emphasis among the countries. Surely the United States, as the broad field of endeavor of the students, deserves the largest share of time. Perhaps two-thirds is not too great a share. This two-thirds includes of course the home geography of commerce and industry. In the average manufacturing city of Massachusetts a teacher skilled in pointing out important local problems may well spend thirty or forty periods in this home work. During the course, however, constant reference should be made to the whole United States. There should be continual comparisons between the degree to which a given activity prevails in one part of the country and in another. In such comparisons emphasis should not be placed upon the political division but on the geographical regions. Statistics should be used freely, but they should largely take the form of comparisons of the production, consumption, etc., per *individual,* and not for the total of a given territory or area which may have many or few people. In discussing the United States similar comparisons should continually be made with foreign countries. This is particularly important in order to avoid the dangerous tendency of Americans to underestimate the other parts of the world.

Next to the United States the largest share of time should be given to Great Britain, Germany, and France, and to the group of minor countries which share their industrial supremacy. This is advisable not only because these countries have important trade and political relations with the United States but also because they are able to teach our country many important lessons in commerce and industry. A number of other countries should be briefly studied for special reasons; Japan, for its rapid advance in manufacturing and commerce and as the only Asiatic country which in any way rivals the United States; Italy, for its immigrants to America, and as a growing factor in European markets; Russia, as the nearest counterpart of the United States

in the Old World in its physical conformation; China, as a region of primary production of silk and tea, and as a future market for many American products; Brazil, because of the coffee and rubber; Chile, as a producer of nitrate of soda; Argentina, as a market for our manufactured goods and as a competitor of the United States in the European market in selling grains and meats; and the tropical regions as the world's greatest undeveloped areas and future producers of wealth.

Still other countries may be brought into the course to illustrate the working of certain principles: Norway, for instance, to show how a rugged region and irregular coastline force the inhabitants to become sailors or fishermen; Central Africa, to bring out the relation between an undeveloped region and primitive means of transportation; Mexico, to make clear the need of a stable government as a basis for progress in any occupation or industry; and Egypt, to show what irrigation can accomplish in the desert. This kind of work is well adapted for special treatment by selected students who will report to the class.

Time will not permit an exhaustive treatment of the four fields of commercial and industrial geography. Therefore, the subjects to be treated must be selected with care. In the field of primary production, for instance, only those products should be treated that are of special importance; (1) to the United States, because we produce vast quantities, such as cotton, corn, copper, coal, iron, and wheat, or because we consume vast quantities of goods produced elsewhere, such as coffee, silk, and rubber; (2) to the local community because they are produced extensively, such as tobacco in the Connecticut Valley, or because they are used as raw materials by the local factories, such as hides in a tanning town.

Practical Suggestions to the Teacher of Commercial Geography

1. In all recitation work that has to do with places, have the students make constant use of the wall map.

2. Use outline maps for locating important products, commercial centers, and trade routes.

3. As a rule "Why" questions are far more valuable than "What" questions. "Why" questions develop power in reasoning; "What" questions develop mere memory.

4. A knowledge of the location of places cannot be attained merely as incidental to the study of important relations. There should be frequent, rapid reviews in the location of places.

5. Let the pupils gather interesting newspaper clippings

and pictures from newspapers and magazines, and let them report to the class their own interpretation of these.

6. Remember that, at best, text-books of commercial geography merely direct the main lines of work. The local surroundings furnish the living problems, and maps, atlases, encyclopedias, government reports, magazines, etc., are all good reference sources.

7. The students' interest is of fundamental importance. If it is wanting, adjust your work to secure it.

8. A good museum showing commercial commodities and their various stages of manufacture, is of great aid in making the work concrete, and in securing interest. Many companies are glad to donate exhibits.

9. Take excursions, if possible, to farms, mines, wharves, freight houses and yards, and factories, and be sure they are carefully planned to lead the students to see the "What's" and "Why's" of commerce and industry.

10. Do not teach too many topics. Remember the aim of the course is to develop power in the student, rather than to cover a certain amount of ground in the book.

THE TUNNELS OF THE ALPS

By Hazel M. Ketcham
Grand Rapids, Mich.

IN this age of iron and electricity great progress is being made in all lines and this advancement is especially marked in constructional engineering. In every continent we find man conquering the grandest of Nature's efforts by means of canals, dams, or tunnels.

In a former age the Alps were much dreaded and travelers avoided the dangerous gorges and difficult roads. Now they are crossed by eight railway lines and all of them have tunnels, some of which are from 9 to 12 miles in length. The most important of these are the Mont Cenis, St. Gothard, Arlberg, Simplon, and Lœtschberg.

The art of tunneling dates back to remote ages and there are records of such works being constructed 500 to 600 years before the Christian Era; but all of the large tunnels have been built within the last hundred years.

The Mont Cenis tunnel was the first large tunnel to be built in the Alps and when it was started the use of machine drills was not known; such drills were not introduced until four years later

and up to that time all the work was done by hand at an average progress of 9 inches per day.

The St. Gothard tunnel was constructed next and although it is not so long as the Simplon tunnel, the death rate was much higher. Most of these deaths were due to insufficient ventilation and the high temperature of the tunnel; as a result the workmen were much better cared for in tunnels built later. In addition to the main tunnel, 9¾ miles long, the St. Gothard Railroad has six shorter spiral tunnels in which the railway makes complete loops and double loops within the solid rock of the mountains.

Since Roman times the Simplon pass has been the avenue of trade between Milan and the Rhone valley. In 1806 the Simplon Pass Road was built by Napoleon and the Simplon tunnel, the longest railway tunnel in the world, was practically completed 100 years later. It begins near Brieg, Switzerland, and ends near Iselle, Italy, and saves three and one-half hours in time of transit between Paris and Milan.

The tunnel consists of twin single track tunnels at a distance apart from center to center of 55 feet, and exactly parallel in plan and profile. One of these tunnels was completed in 1905, but the other was made only a working gallery at first. Work was begun on the second tunnel in 1912, and it was half completed at the end of October 1915. The work was very much interfered with by continual change in workmen due to the drafting of Italian laborers for the army. The tunnels are connected every 220 yards by transverse tunnels to aid in the circulation of air.

As soon as work was begun on these tunnels permanent ventilation plants were installed at each end, and in the second tunnel a new process was used to overcome the intense heat. Cold water brought from the outside was run through pipes pierced with little holes and was thus made to fall in a fine rain. Through this liquid curtain fresh air was forced, reaching the laborers so cooled as to be endurable. Water power was employed for practically all purposes in the first tunnel and compressed air in the second.

All of the Alps tunnels, up to the time of the building of the second Simplon tunnel, were lined with natural stone. This tunnel was lined with natural stone where there was a great deal of moisture or the pressure was very heavy; in all other places it was lined with an artificial stone made in the shape of bricks.

The Loetschberg tunnel was built in the northern Alps and is the largest tunnel in the world in that it contains two tracks.

Everything in the building of this tunnel was done by electricity from practically one source, that was the Kander torrent. This torrent flows from the heart of one of the highest glaciers and though but a creek in volume, the water flows down the steep slopes at such speed that it generated most of the electricity used.

The entire Loetschberg line was put into operation in 1913 and is operated entirely by electricity. Electrification of the Mont Cenis railroad is under way and there is no doubt that before long all the trains crossing the Alps will be run by electricity obtained from mountain streams.

	Length	Date of beginning	Time in building
Mont Cenis	7½ miles	1857	13 yrs. 1 mo.
St. Gothard	9¾ miles	1872	7 yrs. 4 mo.
Arlberg	6¼ miles	1880	3 yrs. 4 mo.
Simplon 1st	12¼ miles	1898	6 yrs. 6 mo.
Simplon 2nd	12¼ miles	1912	
Loetschberg	9 miles	1906	4 yrs.

THE NILE DAM AT ASSUAN

By Nelle G. Hudson
Boscobel, Wis.

SOMEWHERE in the dim vista of the past a branch of the Hamitic family found its way into the northeastern part of the Dark Continent. Here existed a region lacking rainfall and yet luxuriant vegetation abounded along the flood plain of the great river. The benevolence of the stream seemed never to cease as it wended its way northward to join the sea.

Their agriculture was of the crudest kind but still it supplied their wants. No one knows the exact date of the beginning of irrigation in Egypt but we may at least say 5,000 years. Still the fertility of the soil is unabated. The annual overflow of the river has supplied the abundant plant foods which have given to this soil the name of "everlasting."

Until recently the Egyptians used the system known as *basin irrigation*. In this system many basins varying in size from 5 to 50,000 acres, were shut off by means of water tight embankments. During flood they were filled to a depth of four feet or more, and were allowed to stand for six weeks. Then the water was drawn off and the seeds planted in the mud.

Such a system is wasteful of water. Mohammed Ali, a reigning viceroy, saw this and at the same time realized that

under such a system Egypt was not at her best. He determined to change it all, and he did. From this time (1820) dates the renaissance of agriculture in the Nile Valley. It made possible the culture of cotton and of harvesting more than one yearly crop of selected agricultural products. At the present time, out of the 6,250,000 acres of land cultivated in Egypt, less than 2,000,000 have the basin irrigation.

After the English secured control of Egypt they set about to improve and increase its agricultural output. They found the chief drawback to be lack of moisture. Their irrigation was wasteful of water, and their methods of tillage were antiquated. The water supply was most important and they looked to that first.

Perennial irrigation for the region would require 30,000 cubic feet per second; the Nile furnished a constant supply of 8,000 cubic feet. Hence some means must be found of supplying this deficiency. It was found that in times of flood the river supplied from 300,000 to 500,000 cubic feet per second, and the engineers determined that the necessary procedure was to store some of this water by constructing a system of dams and regulators.

Assuan at the First Cataract was selected as the most favorable site for a great dam. Here the river flows over a bed of granite which gives a suitable foundation for the masonry. When excavations were made the surface rock was found to be disintegrated to a depth of 45 feet, and an immense amount of material, 824,000 cubic yards, had to be removed. The dam would have to be so constructed as to discharge the whole flow during the early flood period on account of the great amount of sediment present in the water. If the silt-laden flood waters were stored, the accumulation of mud would soon fill the reservoir. The river is free from silt by December, therefore the reservoir would have to be filled during December, January, and February, and drawn down during May, June, and July.

The construction of this reservoir was awarded to a firm of English contractors who adopted Sir William Willcocks's plan with some modification. According to the first plan the dam was to be 100 feet above its base and was to hold 85 billion cubic feet of water. If so constructed the Island of Philae would be covered to a depth of 40 feet. This caused trouble at once, and a world-wide protest arose, for this island has the best preserved temples of ancient Egypt. It was compromised by building the dam 26 feet lower than original plan, and to hold 35 billion cubic feet of water. It was completed in 1902.

In order to give an idea of the size of this reservoir I give the following figures:

Total length of dam including lock	6400 feet
Solid masonry	1800 feet
Masonry containing sluices	4600 feet
Greatest height above foundation	96 feet
Maximum depth of water at dam	65.6 feet
Width of top of dam	16.4 feet
Number of sluice ways	180
Amount of masonry	700,000 cu. yds.
Number of men employed	12,000

When full at the present time it holds 37 billion cubic feet of water and backs up the water for nearly 200 miles.

THE FILING AND PRESENTATION OF ILLUSTRATED GEOGRAPHICAL MATERIAL

By Sayrs A. Garlick
Chicago

THINKING that the following suggestions would prove of value to those enthusiastic teachers of Geography who present that science as a live and vital study to the child, I take this opportunity of circulating a successful method of presenting pictures to the children.

As by far the vast majority of my pictorial material is taken from *The National Geographic Magazine* all dimensions are given with the view of accommodating a page of that size. Obviously the dimensions may be altered to meet the individual's need.

I find it of value to keep the articles appearing in the magazines intact, and my method of filing and presentation is adapted to that end. For filing purposes the Bushnell "Paperoid" expanding wallet 9″x12″ with 1¾″ expansion is used. However its manufacturers, The Alvah Bushnell Co., of Philadelphia, Pa., supply the wallet in various sizes. The pages of the magazine are removed from the binding by bending back the clips, after which they are cut apart with a paper knife. To preserve the entire article and to keep the pages in their correct sequence they are held together with a large-size paper clip. The articles are then filed according to the country or type of subject matter of which they treat. On the outside, in the upper corner of the filing wallet, the name of a country or special topic is printed, and as this wallet contains only such subject matter as is indicated, it is a simple matter to locate any desired pictures. In some cases

it will be found that the last page of one article and the first page of another are on the same sheet. In this case the sheet is kept with the first, and the title of the following one is copied on the second page of the subject matter to which the title is relevent, and a notation is made to indicate in what wallet, and in connection with which article the missing page may be found.

In case only certain pages or pictures are desired, the clips can be removed and the page or picture laid aside. To assure the return of the page to its proper place it is advisable to write a number on the first remaining page and duplicate that number

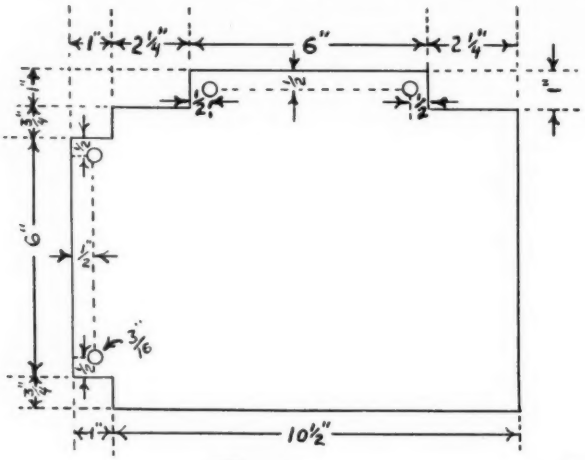

Fig. 1

Fig. 2

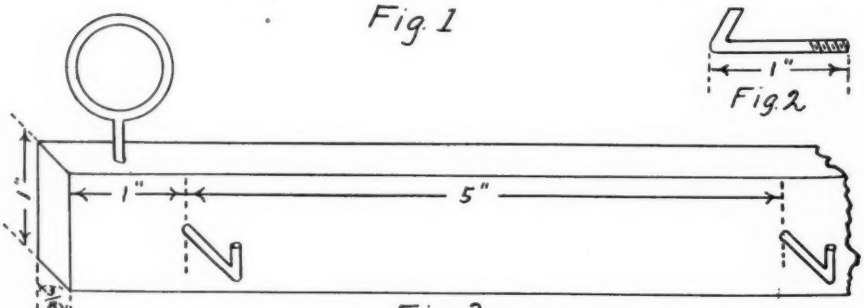

Fig. 3

on each leaf removed. This insures facility in returning the pages to their proper place, in case pages from various articles have been removed for use during the same lesson.

Often there are useful picutres on two sides of the same sheet. If the picture is pasted on a mount-board, obviously one picture is lost. The writer is indebted to *The Journal of Geography* for the suggestion that pictures be attached to mount-boards by clips affixed to the four corners. This obviates handling a heavy and bulky accumulation of useless card-board.

Fig. 1 is a sketch of the card-board to which the pictures are to be attached. Its construction and advantages are self evident in the diagram.

After the pictures are attached to the card-board they are hung before the class on 1″ hooks (Fig. 2). These hooks are bent back on themselves to prevent any breeze from blowing down the card-board. As shown in Fig. 3 the hooks, 5″ apart, are screwed into a hard-wood strip (soft wood sags excessively) to accommodate the holes in the card-board.

The strips are hung by means of hooks and screw eyes, one set at either end and one midway between, if necessary. Too often teachers hang their pictures at a considerable height above the level of the child's eyes. The height at which these strips are to be suspended or fastened for study purposes is determined by the average height of the children.

As it is worth while to have pictures constantly before the children during the study of a country I have provided hooks for hanging the strips at two elevations. When they are being viewed, the pictures hang at the lower level and when not being studied they hang at the higher level, in line with the top of the black-board where they do not interfere with its use.

The advantages of the strip over the usual method of hanging or setting pictures on the moulding are that (1) the pictures are presented at the right elevation, (2) short printed descriptions may be written on the board below the picture, (3) pictures are saved the wear and tear incident to passing them, (4) lack of confusion, for the pupils can pass in orderly rows to see the pictures, (5) children are free to view them at their leisure, (6) many pictures may be handled in a unit.

All of the construction work and library work set forth can easily be done by the children with some little help from the teacher.

Salt Evaporation a Big Industry

In the production of that indispensable condiment, salt, the United States is happily independent of all other countries. The 38,231,496 barrels of salt produced in 1915 by 14 States, Porto Rico and Hawaii constituted 99 per cent of the salt consumed in the United States. Salt occurs naturally in two distinct ways—as rock salt, in beds or associated with bedded or sedimentary deposits, and in natural brines. The larger part of our salt is obtained by converting rock salt that lies deep below the earth's surface into artificial brines, which are pumped to the surface and there evaporated.

CURRENT MATERIAL FOR THE GEOGRAPHY TEACHER

Icebergs the Deadliest Menace to Ships

There are few matters about which such widespread ignorance prevails as about the ice masses with which the North Atlantic, in the region of the Grand Banks, is bestrewn every spring and summer. The general impression is that this is ice which is formed along the coast of Newfoundland and Labrador and is released every spring, but, in truth, the origin of the icebergs and icefloes is entirely different. Icebergs are huge masses of glaciers formed in the vast Arctic continent of Greenland.

The glaciers slowly but irresistibly press seaward through the Greenland valleys into the ocean, where, when the weight of the outer portion, once it is unsupported by the land, becomes too great, it breaks off from the parent mass, a process called "calving." The calving portion becomes an iceberg, and sometimes these are of enormous size—many miles in extent indeed, and often so vast that they ground on the shoals in the region, until, by the play of the winds, the seas, the currents, and the sun, they become top heavy and tumble over again to break apart into smaller fragments which are ferried southward on the bosom of the Polar current and which ultimately reach the avenues of ocean travel. These floes can only make their escape from the Arctic waters during the brief three summer months.

It takes these ice-masses six or eight months to voyage over the two thousand miles separating Melville Bay, in West Greenland, from the Grand Banks, and the larger bergs, which often ground along Labrador, are even longer on the way.

These floes, and the bergs which are often amongst them, but which are increased later in the season by a vastly larger number of bergs that sail along in solitary grandeur after having had their progress retarded by grounding on shoals or points of land as they came southward, disperse themselves over the Grand Banks and become the very worst sort of menace to ocean shipping. It would be possible to occupy the whole of the space devoted to this article in merely summarizing the cases of ocean steamers which during the past fifty years have met disaster through collision with icebergs in the waters off Newfoundland. All other records in this regard, however, were completely overshadowed by the appalling disaster to the *Titanic*. This mighty master creation, the greatest the world has ever seen, was eliminated in the brief space of a few hours, through the mistaken idea of some of those in authority on board, that she was so staunchly built that she could defy all agencies of nature and race with impunity through ice-laden seas.

As the summer advances and the sun becomes more powerful, the bergs melt into smaller fragments or upset and break into pieces on the shoal ground of the Grand Banks, being then swept into the Gulf Stream, where they lie in the way of the steamers plying east and west and cause the shipping casualties so frequent during these months. Still mightier bergs, however, ground along the coast of Newfoundland in the spring and summer, and move southward in the fall.

Admittedly the worst danger menacing transatlantic travelers in modern days, with steamers of such speed as are plying on the Atlantic, is that of collision with an iceberg in a dense fog. It is morally certain that the mysterious disappearance of big steamers like the *Naronic* and the *Huronian* in more recent years, and of many others previously, is attributable to this cause, for no other agency is usually powerful enough to work the ruin of a modern liner with her cellular bottom and watertight bulkheads.—[From "The International Ice Patrol," by P. T. McGrath, in the *American Review of Reviews* for September, 1916.]

Strategic Value of the West Indies

The Danish West Indies consist of the three islands, St. Croix, St. Thomas, and St. John. They are tiny bits of land, their total area being only 138 square miles. St. Croix and St. John are extremely fertile, the former producing the famous "bay-rum." St. Thomas, though less fortunate in the matter of soil, nevertheless holds within its tiny self a pearl of great price—the deep,land-locked harbor of Charlotte Amalie, the most magnificent natural naval base in the whole West Indies with the exception of the Dominican bay of Samana and the Haitian port of Mole-Saint-Nicolas. I shall not soon forget the impression of strategic power which the place made upon me when I visited Charlotte Amalie in the spring of 1912. Our 16,000-ton liner slipped through the narrow opening from the sea and came to anchor in a broad sheet of mirror-like blue water guarded by a continuous circuit of lofty hills. First impressions in this case proved correct, for I subsequently learned that military engineers agree in stating that the conformation of these hills is so remarkably adapted to defensive purposes that a very moderate sum expended upon fortifications would render the island absolutely impregnable. In fact, St. Thomas has often been called the Gibraltar of America.

And St. Thomas' natural strength is still further enhanced by its strategic situation. There are only three gateways which

deep-draft ships from Europe employ to enter the Caribbean: (1) the Windward Passage, between Cuba and San Domingo; (2) the Mona Passage, between San Domingo and Porto Rico; (3) the Virgin Passage, between Porto Rico and the tangled archipelago of the Lesser Antilles. The first two are already half way under our control; with the acquisition of the Danish West Indies the last great gateway to the Caribbean would fall entirely into our hands, for St. Thomas stands squarely athwart the Virgin Passage and no hostile fleet could safely pass the menace of its guns.

It is indeed a lordly sea to which these water-gates give access. The Caribbean, lying like a huge elongated quadrilateral between the island-chains to north and east and the mainlands to south and west, stretches nearly 2000 miles from the Yucatan Channel at the entrance of the Gulf of Mexico to the eastern barrier-chain of the Windward Islands, while its average breadth from north to south is over 500 miles. The Caribbean thus well deserves its happy title, "The American Mediterranean."—[From "The Danish West Indies: Keys to the Caribbean," by T. Lothrop Stoddard, in the *American Review of Reviews* for Sept 1916.]

Toll of the Commerce Through the Panama Canal

More cargo passed through the Panama Canal during July than in any month of its operation excepting July, 1915, the quantity being 648,957 tons, as against 705,469. The figures of May and June were 494,150 and 517,791 tons. The tolls for the month were $460,122.95. The traffic in the two directions was pretty evenly balanced, being 296,094 tons from Atlantic to Pacific and 352,863 tons passing Eastward.

The most important item of cargo measured in tonnage, was nitrate, of which 220,887 tons passed Eastward, 155,630 tons to United States ports, 6429 tons to Rotterdam, and the rest mainly to Liverpool, Glasgow and French ports. The next largest volumes were in coal, 56,477 tons to West Coast ports of South America and petroleum of which 27,657 tons passed West to China, Chimanpo, and Australia. There were 25,394 tons of iron and steel and 18,184 tons of machinery also in the West-bound traffic, most of it American en route to Chile, Australia, Hong Kong, Japan and Vladivostok. Over 16,000 tons of sugar came Eastward, nearly all to United States ports.—[*The Americas.*]

Norfolk has a magnificently protected harbor 30 miles inside the entrance to Chesapeake Bay and 187 miles south of Baltimore. In its original condition there were shoals in the channel which gave a minimum depth of 19 feet in the western branch, 15 feet in the eastern and 12 feet in the southern. Im-

provement was begun under a project adopted in the Act of 1876 to which there have been frequent modifications and extensions. The amount spent on the earlier projects was $2,633,000. In the Act of 1910 a modified project was included which contemplated a channel 11¾ miles in length with 35 feet minimum low-water depth and a width of 400 feet from deep water in Hampton Roads as far as the Navy Yard, thence up stream on the three branches on somewhat reduced dimensions. This project is now complete, at an additional expenditure of $881,000, and Norfolk now has in addition to the 35-foot channel to the Navy Yard, a 30-foot channel to Lambert Point, 25 feet to the Virginian Railroad bridge and 22 feet to the Norfolk and Western Railroad bridge; in the eastern branch, 25 feet to the Norfolk and Western Railroad bridge and 22 feet to the Campostella bridge; in the western branch, 24 feet to the first bridge and 16 feet for some distance further up stream, also in the western branch 24 feet as far as West Norfolk bridge. These works of improvement give a maximum low-water drafting from the port of Norfolk to the ocean of 35 feet, from the southern branch 22 feet, from the eastern branch 22 feet and from the western branch 24 feet.

The past few years have witnessed the construction of great modern railroad terminals at Norfolk for the coastwise and foreign shipment of coal and other bulk cargoes. There is an active barge traffic in coal, northbound, by both bay and ocean routes, and a growing northbound barge trade in lumber, cotton and other products from North Carolina waters. The city of Norfolk has also under consideration the construction of public water terminals, under plans in charge of a public commission.

Ten miles west of Norfolk harbor is the comparatively new harbor of Newport News, the terminus of the Chesapeake and Ohio Railroad, and the location of large shipbuilding and repairing industries. The port is advantageously located near the affluents of the James River with Hampton Roads. In its original condition the harbor had a low-water depth of 25 feet. The Act of 1902 adopted a project of improvement under which $237,500 was spent for original work and maintenance. The Act of 1910 adopted the present project which authorized a channel 400 feet wide with low-water depth of 35 feet for 3½ miles. This work is now completed at a cost for original work and maintenance, of $471,000. In addition to its important coastwise trade and ship-building industries Newport News is a port of growing importance for the export of grain, coal and agricultural products.—[W. H. Schoff in *Commercial America.*]

RECENT PUBLICATIONS

ESSENTIALS OF GEOGRAPHY, by Albert Perry Brigham and Charles T. McFarlane. First Book, 266 pages; Second Book, 426 pages. Size 8 x 10 inches. The American Book Company, New York, 1916. Book I, $.72; Book II, $1.24.

The appearance of this series of geographies marks another epoch in geography publication in this country. We have been steadily advancing along this line, and it is a pleasure to all friends of geography to see that the advance is continuing.

The fact that the publishers have adopted the 8 x 10 size for these books seems to indicate that the large old-style, atlas-like geographies are to be discontinued. The small size attempted in the first Tarr & McMurry series seems not to have been successful, although in Great Britain this small size prevails. The 8 x 10 size, which is substantially that used by the new Tarr & McMurry and by Dodge, as well as by Brigham & McFarlane, satisfactorily meets the objections to both the large size and to the small size books, and, we believe, will be generally adopted in this country.

In their manufacture the books are models. The binding is strong and substantial; the paper, presswork, and illustrations are excellent. As soon as the book is opened it creates a highly favorable impression. The colored maps are large enough and are not overcrowded with names. The brilliantly colored relief maps in Book I will not please everyone. There is some question whether the colors used in the physical maps create the impression which is intended. In these maps the lowest land is colored a darker tint than the next two higher levels of land. This might create an erroneous impression; for some reason, looking at these maps, one feels that the light buff tint is lower ground than the darker bluish-green while, as a matter of fact, it is higher.

The illustrations are chosen with exceptional thought and care. Practically everyone tells its own story. The black and white sketch maps are very neat and effective. The small railroad map (Fig. 147 in Book I) is out of date, showing, as it does, only one Pacific railroad crossing the Sierras east of San Francisco, and only two crossing central Washington to Puget Sound. This, on so small a map is, however, a minor matter.

One cannot read the first 50 pages of Book I without feeling that a different treatment might have been more effective. The method employed in the first part of Book II, if applied to Book I, would have impressed the minds of children more. It is pretty well established as a principle of pedagogy that children's

minds work from the concrete toward the general. The first 50 pages or so of Book I deal with principles and general ideas which might better be formulated after studies of concrete cases had been completed. Remembering that the first part of Book I is to be used by children of only 10 years of age, it seems doubtful whether such topics as, The Cause of Winds, The Influence of Government on Industry, and definitions of a republic, kingdom, and absolute monarchy are in place. In general, the topics treated in the first part of Book I seem to be too large and require a greater maturity of mind than can be expected in little children.

The pedagogy employed in Book II is unquestionably sound. The plan followed in the second book is stated by the authors as follows: "The principles and forces with which physical geography deal are brought in at appropriate points of application in the regional treatment. Thus, rivers and valleys are studied in a passage that leads to an account of the drainage of North America; volcanoes are studied in connection with the study of a well known volcano, Vesuvius. Wheat, for example, is described as fully as possible in the account of the region where it first appears in a large way, that is, in North Central states. In like manner, iron is treated with Pittsburgh, and irrigation with the plateau states." Experienced teachers will agree with this method of treatment.

The physical-political maps used in Book II are excellent, with the possible question already raised regarding the wisdom of representing higher lands in a lighter tint than that used for the adjacent lower lands. The larger western states have relatively far more cities shown than the eastern states. This might mislead children regarding the extent of settlement and development of the western states unless the teacher introduces the necessary caution. The practice employed in some books of printing a small inset map of one of our states—Pennsylvania or Colorado—along with the maps of foreign countries in order to bring out relative sizes is a good practice. We miss them in the Brigham & McFarlane books.

The style is notably clear and vivid; it could scarcely be better. The topics selected for emphasis are chosen with rare good judgment. The human side of the subject is emphasized, as it should be, although the physical side is not neglected; in fact, the combination seems very nearly ideal. Causes are treated without being overstressed.

The books show, from beginning to end, painstaking care and repeated working over of text. Possibly the delay in the

publication of these books which the European War caused has not been entirely unfortunate, for it gave the authors and publishers full opportunity to do their very best in every particular. The brief summaries at the end of sections in Book I are probably helpful: surely the questions at the end of divisions are. The list of useful references is styled "short," yet it is adequate. One closes the books with a feeling that they are a credit to American geography, and set a high standard for future writers and publishers. R. H. W.

ELEMENTS OF MINERALOGY. By Frank Rutley; revised by H. H. Read. Nineteenth edition. D. Van Nostrand Co., New York, 1916. 394 pages. $1.25 net.

The author and the reviser are Englishmen and the book is printed in England by Thos. Murby & Co., London. Part I treats of the properties of Minerals and Crystallography. Part II consists of a description of Mineral Species.

PHYSICAL GEOGRAPHY OF WISCONSIN. By Lawrence Martin. 550 pages; 206 text figures; 41 plates. Bulletin 36 of the Wisconsin Geological Survey.

We select the following excerpts from an editorial in the Brooklyn *Standard Union.*

Prof. Lawrence Martin's *Physical Geography of Wisconsin* deserves much wider reading and notice than it is likely to receive. The author, speaking always by the card and using strict technical terms, does not, however, as so many 'highbrows' and officials appear to, despise facts of human interest and language which common people can understand.

"When one thinks of the millions of the peoples' good money buried in official and statistical reports, never read, and destined ultimately only for the papermakers' vats, to be transformed by chemicals and capital, which might be put to far better uses, into material for another dreary, wasteful round, one is inclined to regard Prof. Martin's book as marking an epoch, a real classic in official, scientific literature.

An idea of the human interest and literary quality with which the book is infused may be gathered from this example:

"The territory and state of Wisconsin have at various times been attached to Indiana, Illinois and Michigan. Wisconsin has included Minnesota, Iowa and the Dakotas. It has possessed and lost the sites of Chicago, St. Paul and Minneapolis, the iron mines of Minnesota, the iron and copper mines of Michigan, the coal and lead mines of northern Illinois, and the rich corn and wheat lands of Iowa, of northern Illinois, and of the Red River Valley in Minnesota and the Dakotas."

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